Foodborne Infection by *Shigella*-*Shigellosis* Food Poisoning

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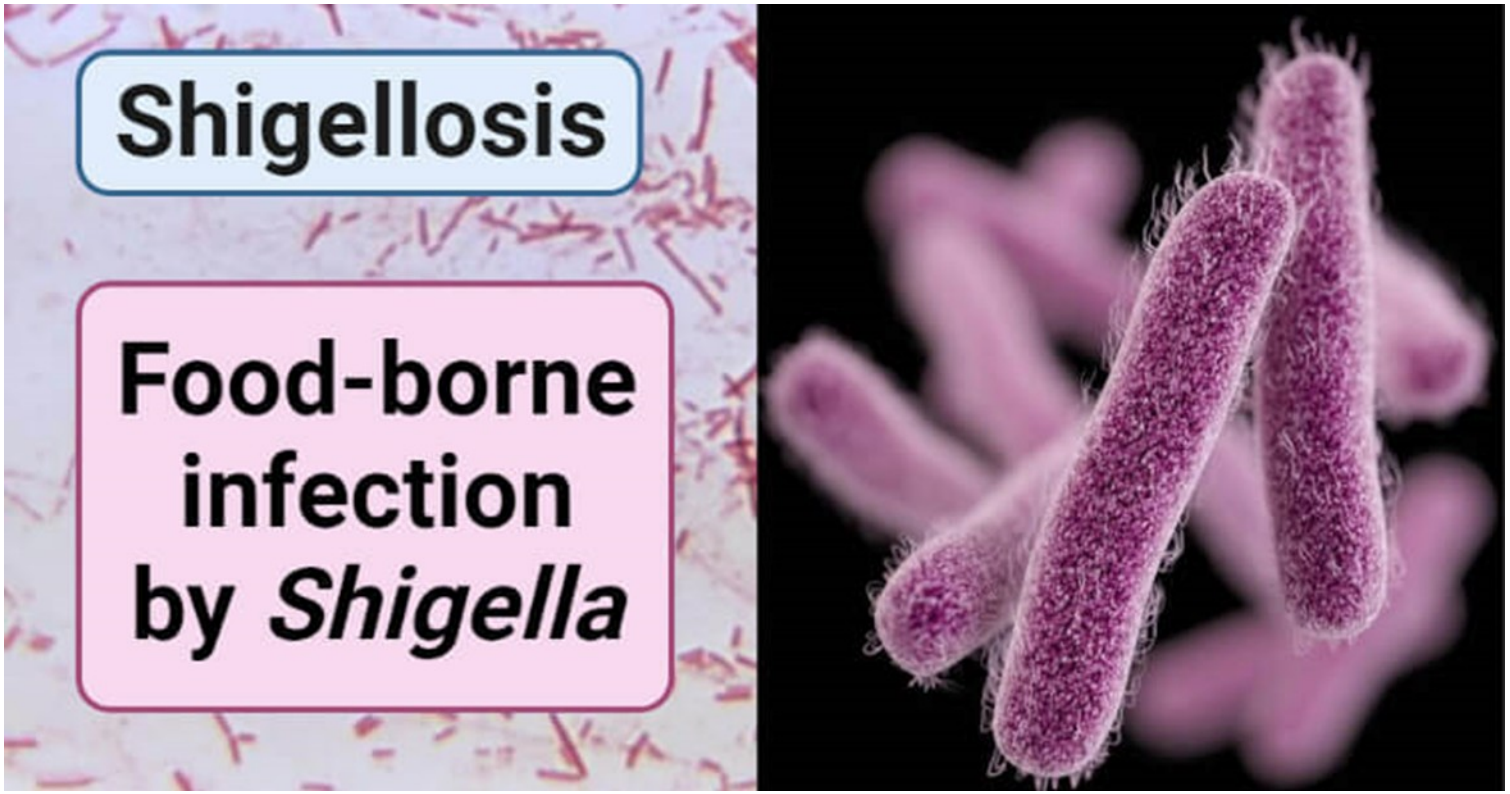


Introduction

- Shigella species are responsible for causing acute gastrointestinal tract infections that damage the ileal and colonic epithelium and cause bacillary dysentery.
- The mortality rate of Shigellosis is high especially in children under 5 years with malnutrition.
- The person suffering from Shigella infection undergoes impaired nutrition due to the heavy loss of electrolytes and blood during diarrhea which may lead to the death of a person.

Biological species and characteristics

Antigen Structure – Shigella

Four species, based on the "O" antigenic structure have been classified :

- *S. dysenteriae*
- *S. flexneri*
- *S. boydii*
- *S. sonnei*

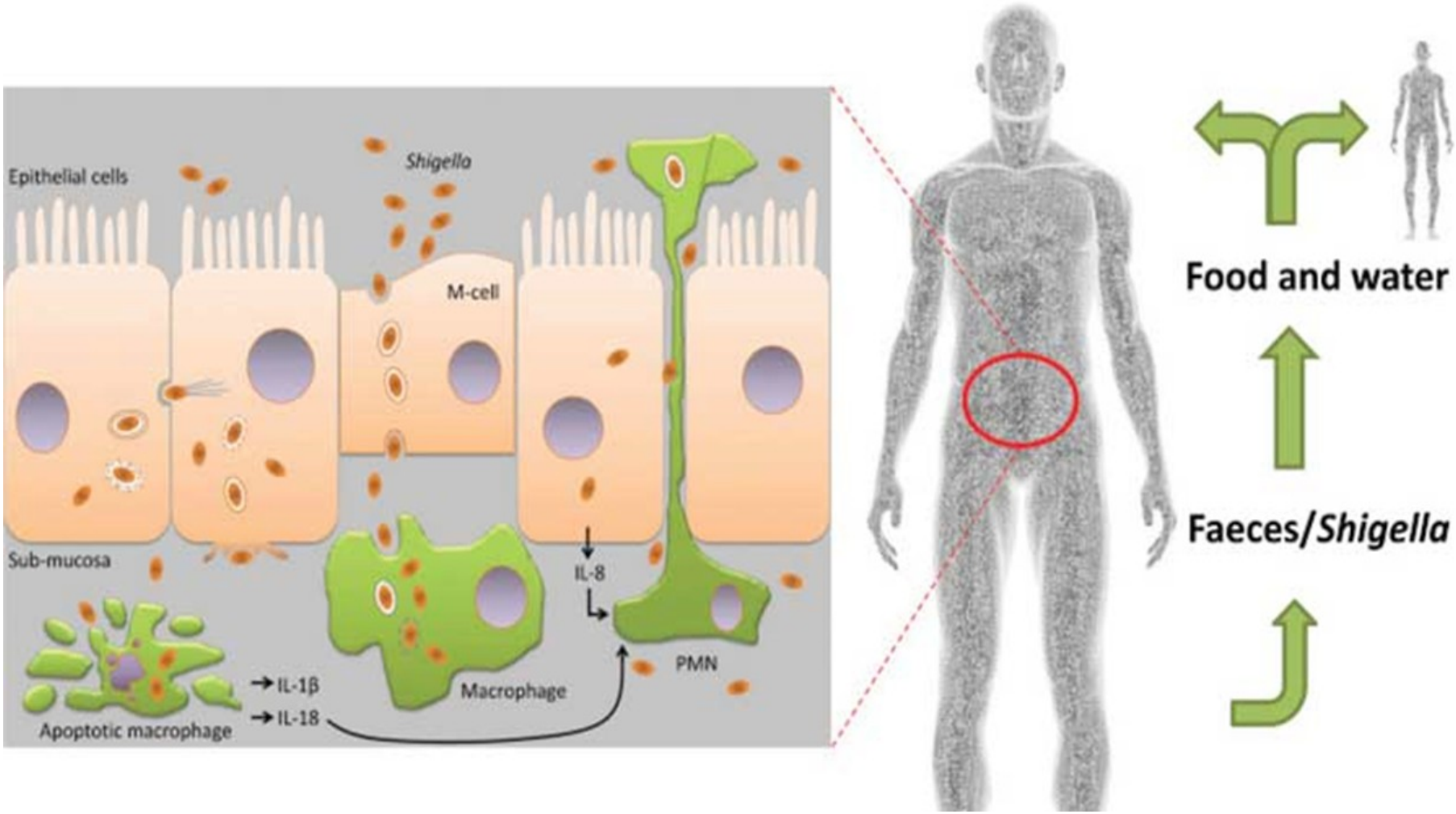
Among these, S. dysenteriae Type 1 is responsible for causing deadly epidemic outbreaks whereas other serotype causes minimum and rare disease.

- Gram-negative
- Facultative anaerobes
- Non- sporulation
- Non-motile
- Non-encapsulated
- Prokaryotic rods
- Optimum temperature – 7 to 46°C
- Can resist 5% NaCl and pH
- Can survive the harsh physical and chemical condition
- Sensitive to pasteurization temperature

Sources and transmission of Shigella infection

- The main reservoir of Shigella species is in the intestinal tract of the human host, via the fecal-oral route and contaminated food and water.
- A small amount of bacterial cells (10 to 100) is capable of causing shigellosis while other pathogens require 1000 to 100000 bacterial cells
- Symptoms usually begin after 1 to 3 days of ingestion of bacterial cells but depend on the amount of dose ingested ranges from 12 hours to 7 days.
- Typical symptoms include fever, loss of appetite, abdominal pain, bloody or watery diarrhea, inflammation of the colon, fatigue, malaise.
- Due to the excretion of excess watery fluid, dehydration may occur.

Mechanism of toxicity of Shigella infection



Laboratory diagnosis of Shigella

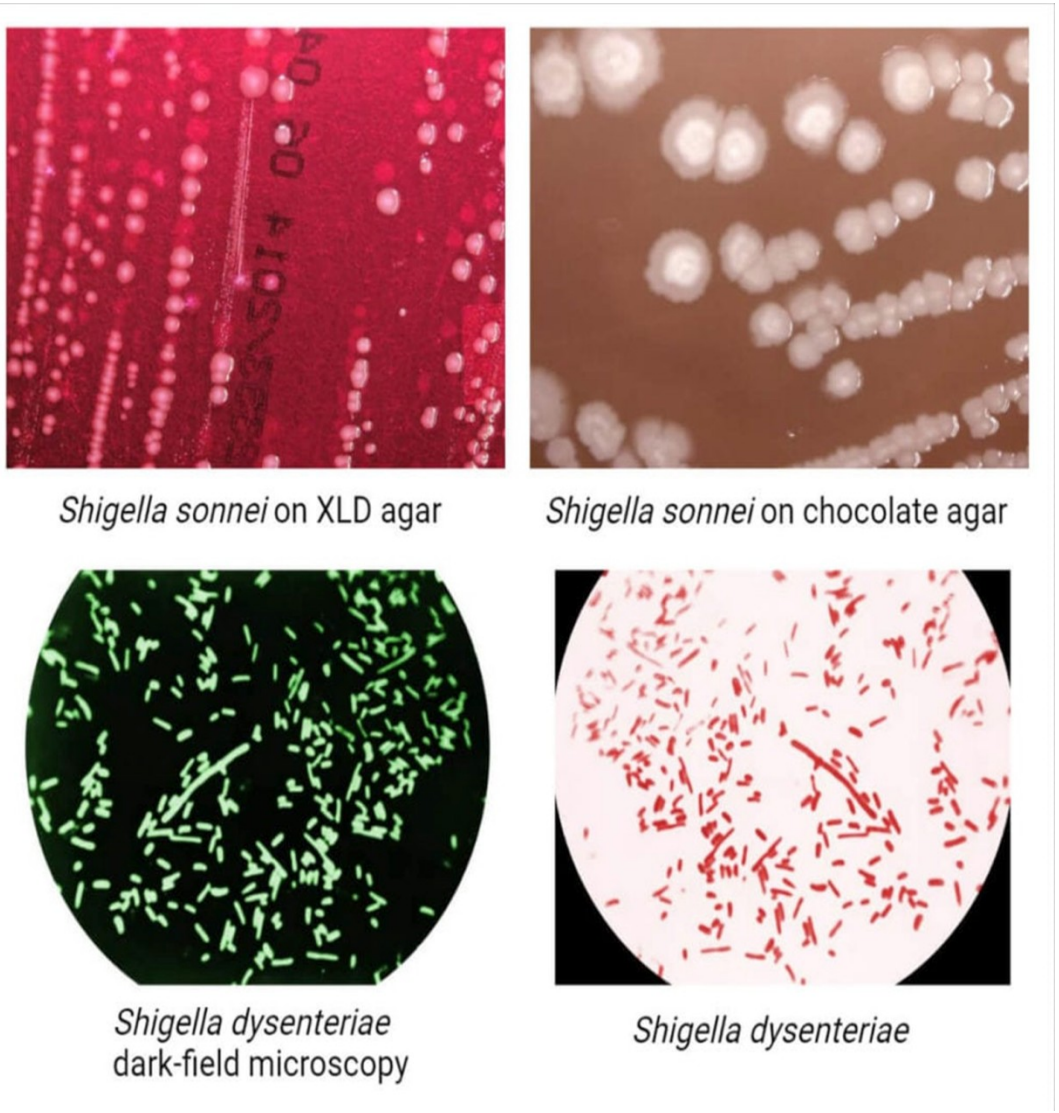
A. Bacterial culture methods:

- MacConkey agar, Salmonella-Shigella agar and Xylose-Lysine Deoxycholate agar are the selective media used for the growth of Shigella.

A. Bioassays.

B. Immunological assays .

C. Molecular techniques like PCR helps in the diagnosis of Shigellosis.



Shigella sonnei on XLD agar

Shigella sonnei on chocolate agar

Shigella dysenteriae dark-field microscopy

Shigella dysenteriae

Treatment of Shigellosis

- A person with shigellosis symptoms must receive antibiotic treatment however in some cases Shigella develops resistance to antibiotics.
- Ciprofloxacin, ampicillin, sulfamethoxazole and nalidixic acid were used to show effectiveness against Shigella and are still in a clinical trial.
- For now, fluoroquinolones and azithromycin are the choice of antibiotics for shigellosis.
- Treatment depends on the severity of the infection and should start early in the course of illness.
- Oral rehydration and intravenous fluid therapy is a common treatment used for an infected person to replace the loss of electrolytes.

References

1. Mumy, K. L. (2014). Shigella. Encyclopedia of Toxicology, 254–255.
2. Ashkenazi, S. (2018). Shigella Species. Principles and Practice of Pediatric Infectious Diseases, 842–846.e2.
3. https://www.researchgate.net/publication/324720426_Shigellosis_A_Conformity_Review_of_the_Microbiology_Pathogenesis_and_Epidemiology_with_Consequence_for_Prevention_and_Management_issues
4. https